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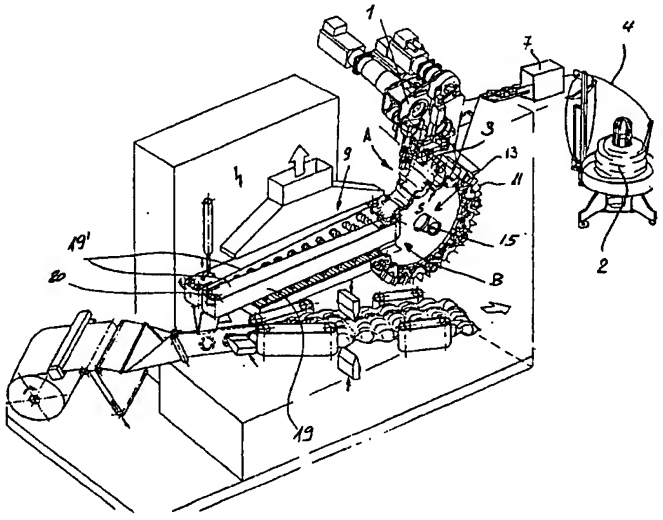
(54) Title: A METHOD AND INSTALLATION FOR THE TRANSPORT OF SPRINGS FOR SPRING INTERIORS FOR MATTRESSES OR UPHOLSTERY



(57) Abstract: In the installation according to the invention the springs (3) wound from a spring winding machine (1), of any height and diameter are led to a transport wheel (13). On the periphery of the transport wheel (13) the springs (3) lie in receiver (11) and are held axially clamped between two circular ring shaped guide plates (21). After the springs (3) impinge in the receiver (11) the spring (3) is pressed together by an advancer (25) and led on a circular travel path from the take-over location (A) to the transfer location (B). At the location (B) the springs (3) are taken over by a second transport means (9) and led to the further processing.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A method and installation for the transport of springs for spring interiors for mattresses or upholstery

The subject-matter of the invention is a method for the transport of springs for spring interiors for mattresses and upholstery according to the preamble of patent claim 1. The subject-matter of the invention is furthermore an installation for the transport of springs for spring interiors and upholstery according to patent claim 6.

Spring interiors for mattresses and upholstery comprise usually a large number of springs with identical properties. With the manufacture of spring interiors with different hard zones, groups of springs have different spring constants which have been produced by differing hardnesses or different geometries. In particular with mattresses with different hard zones the springs used therefore as a consequence do not in every case have exactly the same height or the same diameter.

With the manufacture of geometrically identical springs their handling is simple. After a one-off adjustment of the transport means the springs simply and without disturbance may be conveyed from the winding machine up to the assembly machine. Corresponding transport installations are known in various embodiments.

The handling of springs with a different geometry, i.e. a different number of widings, different diameter, different height is difficult since for grasping such a spring the transport or handling apparatus must in each case be set to the corresponding geometry. If in each case for a larger production quantity a dimension change is carried out this is still ecomonicallly acceptable. If however springs of a different geometry are required in the running production, i.e. in a single spring interior, then the conventional handling apparatus are no longer sufficient or are not in the position of processing these springs.

The object of the present invention is the creation of a method and an installation with which the springs with a different spring geometry and size are securely grasped and may be transported to a subsequent processing station.

This object is achieved by a method according to the features of patent claim 1 and by way of a device with the features of an installation according to patent claim 6.

On has succeeeded by way of the design of peripherally open receivers attached on the circumference of a transport wheel designed as a transport device in taking over springs with a different length, different diameter, different number of windings and or pitch, at the exit of the spring winding machine and transfering them to a subsequent transport means, e.g. in the form of two transport belts. The transfer at the spring winding machine may be effected without an additional handling apparatus singularly on account of gravity. With a higher speed or greater cycle number additionally a so-called counter-hand may support the gravity on transfer. The spring may also be directly wound into the receiver at the transport wheel.

By way of illustrated embodiment examples the invention is described in more detail. There are shown in

Figure 1 a perspective representation with a sectioned visible spring winding machine, with a transport means arranged in front and with a pocketing device (take-over and transport wheel between the spring winding machine and the transport means not shown).

Figure 2 a side view of the transport wheel with a holding belt,

Figure 3 a vertical section through the transport wheel with three part shells per receiver,

Figure 4 an enlarged cross section representation of the transfer region from the transport wheel to the transport belt along line IV - IV in Figure 2,

Figure 5 a perspective representation of the advancer before the pressing-together of the springs,

Figure 6 a perspective representation of the advancer after the pressing-together of the springs,

Figure 7 an enlarged cross section representation of a receiving shell in the take-over and transport wheel (basket opened for laying-in the springs)

Figure 8 an enlarged cross section representation of a receiving shell in the take-over and transport wheel (shell partly shortened, at the beginning of the transport),

Figure 9 an enlarged cross section representation of a receiving shell in the take-over and transport wheel (basket completely shortened, transfer of the springs to the belt face of two transport belts),

Figure 10 a perpective representation of a second embodiment form of the take-over and transport wheel,

Figure 11 a perspective representation of a third embodiment form of the take-over and transport wheel,

Figure 12 a perspective representation of the take-over and transport wheel of the first embodiment form (partly cut open).

In Figure 1 with the reference numeral 1 there is shown a conventional spring winding device for winding springs 3 for the manufacture of spring interiors for mattresses and upholstered furniture. From a winder or coil 2 spring wire 4 is drawn into the spring winding device 1 and here in a known manner there is produced a wound spring 3 of the desired design with respect to diameter, height, pitch and shaping.

The manner of functioning and the construction of the spring winding device 1 and its mechanical and electronic control means with which the shape of the spring 3 is produced and its geometry may be changed are not explained here as it is assumed to be known.

With a take-over and transport wheel 13 represented in Figure 1 the spring 3 is taken over at the spring winding device 1 and led to the transport means 9. The take-over of the springs 3 after winding and separating the spring 3 from the end of the wire is effected by gravity which acts on the spring 3, i.e. the spring falls after its manufacture vertically or in any case guided in a channel into a spring receiving shell 11. With a high cycle speed additionally a counter-hand 10 may support the secure transfer of the spring 3 to the transport wheel (Figure 2). It is of no significance which geometry and size the spring 3 has since it after the transfer to the transport wheel 13 falls firstly loosely into one of the peripherally open receiving shells 11. The receiving section of the receiving shell is larger than the cross section of the largest spring 3 to be processed. A heat treatment station 7 (shown as a black box in Figure 1) for the heat treatment of the spring 3, inasmuch as one is carried out, may either be arranged in front of the spring winding device 1 and heat the unwound wire 4 or it may in another embodiment be placed between the transport wheel 13 and the transport means 9 and here heat the manufactured springs.

The take-over and transport wheel 13 according to the invention is drivably mounted on a shaft 15. The subsequent transport means 9 in the form of two parallel opposite-lying belt faces 19' or ones approaching at an acute angle ends in Figure 1 laterally of the revolving region of the receiving shells 11 on the periphery of the

transport wheel 13. In Figure 1 as well as in Figure 2, of the transport means 9 there are visible only the two belt faces 19' between which the springs 3 to be transported away may be clamped in. Not shown are the deflection wheels 20 on the run-in side and their drives as well as the carrier design for the transport means 9.

By way of Figures 2 to 6 subsequently the construction of the first embodiment form of the transport wheel 13 and of the receiving shells 11 fastened on the periphery of the transport wheel 13 at regular distances are explained. The receiving shells 11 may have a V-shaped or trapezoidal cross section. Preferably the side wall 11', lying behind in the rotational direction, of the receiving shell 11, lies essentially in a plane running radially to the rotational axis, in order to favour the entraining of the springs 3, whose end rings 3' and 3" bear draggingly on end plates 21.

Laterally of the transport wheel 13 there are arranged circular-ring-section-shaped plates 31. A guide plate 21 is fastened on the machine frame 31. In one of the guide plates 21 there is attached a receiver 23 corresponding to the cross sectional shape of the receiving shells 11 and in whose cross sectional surface there engages an advancer and a spring 3 lying in the receiver is pressed together. The advancer 25 is seated at the end of a linear drive 27, e.g. a pneumatic piston or a linear motor which guides the advancer 25 out of the rest and receiving position (Figure 5) into a compression position (Figure 6). The linear drive 27 with the advancer 25 is attached laterally next to the transport wheel 13 on the machine frame 31.

The receivers 11 extend axially from guide plate 21 to guide plate 21 and are composed of two or more scale-like arranged part shells 11a and 11b. The scale-like construction of the receivers 11 permits the latter to be adapted to the height of the springs 3 to be processed, in the relaxed condition, i.e. to the respective distance of the guide plates 21. The two guide plates 21 are for this reason axially displaceable. One of the guide plates 21 is preferably fastened on the machine frame 31 in a rotationally rigid and axially undisplaceable manner. The second guide plate 21 is axially displaceably fastened on a rotary bearing 33 arranged on a shaft 15.

The shaft 15 is for example configured as a multi-wedge shaft (see Figure 3) which carries the supports 35a to 35c for the co-rotating receivers 11. The first support 35a carries the first part shell 11a, the middle support 35b the part shell 11b and the third support 35c the third part shell 11c. The outer lying part shells 11a and 11c lie at a minimal distance to the guide plates 21 and with the maximal displacement of the one guide plate 21 are pushed over one another or apart. The displacement of the guide plate 21 for setting the desired height h of the spring 3 is effected by a spindle 37 which is rotatably mounted on the machine frame 31 and engages on the outer lying guide plate 21. On displacing the guide plate 21 the receiving shells 11c and 11b are co-moved by the multi-wedge shaft 15.

The drive of the transport wheel 13 may be effected by a drive belt 41 revolving on a pulley 39 on the shaft 29.

To the recess 23 for the advancer 25 there connects on the outside a scale section 24. This forms a rest and sliding surface for the end of the relaxed spring 3, this end projecting beyond the transport belt 13, before the pressing-together and incorporation between the guide plates 21. Simultaneously the shell section 24 may function as a rest guide for the advancer 25. The recess 23 in the guide plate 21 may lie below the dispensing location of the spring 3 wound on the winding machine 1 and in the region of the apex S of the transport wheel 13 as this is shown in Figures 1 and 2. The advancer is located as a result likewise below the winding location and is fastened on the machine frame 31.

It is however also possible to wind the spring 3 directly axially into the receivers 11. I.e. the periphery of the transport wheel 9 with the receivers 11 would then be positioned directly in front of the winding location on the winding machine 1 (no picture).

The transfer of the springs 3 from the transport wheel 13 to the transport belt 19 is effected after about 270° to the transfer position B (cf. Figure 2). At the location B the two belt faces 19' of the transport belts 19 which revolve parallel or at an acute angle project into cutouts in the guide plates 21. The belt face surfaces at the same time lie essentially in the same plane as the inner surfaces of the guide plates 21.

Between the take-over location A in the apex S of the transport wheel 13 and the transfer location B a belt 47, in particular a steel belt, at its both ends is guided in an arch-shaped manner distanced over the periphery of the transport wheel 13. The one end is rigidly connected to the frame 31, the other end is held by an adjustable tension spring 49. With the latter the belt 47 may be radially tensioned in the direction of the receivers 11 or the springs 3 lying therein. According to the representation in Figure 2 the belt 47 is wound around only about 180° of the transport wheel 13, the section on the run-in side in the connection to the take-over location A is covered by a guide plate forming a quarter circle.

Hereinafter the manner of functioning of the transport wheel 13 is explained in more detail.

The (wound) springs 3 manufactured on the spring winding machine leave the machine at their end-faces and then after completion of the winding procedure are separated off. By way of this the spring may fall downwards by way of gravity alone or additionally accelerated by the counter-hand 10 and reaches the receiver 11 which is located directly below the spring winding location. After the spring 3 has fallen into the receiver 11 on one side it projects beyond one of the guide plates 21 because the distance a of the guide plates 21 is set smaller than the height h of the spring to be transported. With its one end it lies on the shell section 24. With the advancer 25 the spring 3 is subsequently pressed so far together until it lies completely within the inner side surfaces of the guide plates 21. By way of the rotational movement of the transport wheel 13 on which the guide shells 11 are fastened, the spring is pushed from the shell wall 11' by the advancer 25 and held guided on the guide plates 21. The advancer 25, as soon as the end

ring of the spring 3 has left the region 23 returns back driven by the linear drive 27 to the original position in which a newly wound spring is taken up by the winding machine 1. Preferably the receiver 11 accommodating the springs 3 lie in the apex S of the transport wheel 13 during the take-over. By way of the rotation of the transport wheel 13 in the clockwise direction the spring 3 first gets to below the guide sheet plating 51 and by way of this is held rigidly in the receiver 11. With the further rotation of the transport wheel 13 thereafter a belt 47 assumes the holding function of the springs 3 within the receivers 11. According to the diameter of the springs 3 which have just been processed the belt 47 is accordingly adjusted with a tension spring 49. At the transfer location B the springs 3 are inserted between the two belt faces 19' of the transport belts 19 and from these are led out of the receivers 11 and led to a further processing machine, for example a spring interior assembly automatic machine. Preferably the springs 3 in the transition region B are firstly pushed from the transport belt 13 onto two platings 20 which may be introduced between the belt face 19'. As soon as the end rings 3' of the springs 3 lie completely on the platings 20 the latter are pulled out of the overlapping region with the belt faces 19'. The spring 3 by way of the retainer 22 is prevented from being led with the platings 20 out of the region of the transport belts 19. After the retreat of the platings 20, e.g. with a linear motor 24, the springs 3 get between the two belt faces 19' in an exactly positioned manner.

The second embodiment form of the invention is explained by way of Figures 7 to 9.

On the disk-shaped transport wheel 113 on both sides there are arranged stationary rings 121 which do not follow on and in whose outer surfaces there are admitted grooves 123 forming cam paths with which mutually overlapping shell sections 125, 127 and 129, i.e. those engaging telescopically into one another, are displaceable to one another. The middle shell section 127 is fastened on the transport wheel 113 and is not displaceable, the other two shell sections 125, 129 lie in a common mounting longitudinally guiding all three shell sections, or the outer-lying shell sections 125, 129 are carried guided on the middle shell section 127. The shell sections 125, 127, 129 may

consist of rounded or bent platings or shape parts. To the two outer lying shell sections 125 and 129 on their lower sides there are attached guide rollers or bolts 131 which from above engage radially into the grooves 123 on the rings 121. The course of the two grooves 123 on the circumference of the rings 121 is axially symmetrical and effects the synchronous mutual displacement (pushing into one another and pulling out of one another) of the outer lying shell sections 125 and 129 (Figure 12).

Running parallel to the grooves 123 lying distanced from the outer lying edges 126 and 130 of the two shell sections 125 and 129 are guide platings 133. These have a circular ring shaped form and are for example fastened on the rings 121 or on another stationary part of the machine frame 134. The guide plates 133 on the inside comprise a surface which permits a low-friction sliding of the end rings of the springs 3 lying in the receiving shells 111, when these after the traversing together of the shell sections 125 and 129 bear or are pressed on the guide platings 133. The topology of the guide platings 133 runs parallel to the grooves 123.

When the two grooves 123 run near to the outer surfaces 131 of the two rings 121, then the receiving shell 11 has the greatest length (Figure 7) so that a spring 3 may fall loosely therein. If the mutual distance b of the grooves 23 reduces then the two outer shell sections 125 and 129 are pushed towards the middle or over the middle stationary shell section 127 and the spring 3 lying in the receiving shell 11 is pressed to the length a (Figure 8) and gets into contact with the guide platings 133.

Figure 9 shows the two grooves 123 with the smallest possible distance b which is present when the receiving shell 111 moves in between the transport means 117, i.e. between the two belt faces 119 lying opposite one another (location B).

In this region the two circular ring shaped guide platings 133 limiting the receiving shells 111 on the end-face side comprise an interruption through which the belt faces 119 are led and permits the leading-away of the springs 3 through the transport

device 117 when the end rings of the springs 3 slide away from the guide plates 133 onto the transport belts 119 (cf. also Figure 9).

Since the course of the end-face guide plates 133 follows the course of the grooves 123 the distance of the outer edges of the two outer shell sections 125 and 129 to the inner surface of the guide plates 133 remains essentially constant over the whole circumference although the guide plates 133 are arranged stationary.

The peripheral edges 137 of the two circular ring shaped guide plates 133 lie at a small distance to a cover plating configured cylinder surface shaped. The cover plating 139, the two lateral circular ring shaped guide plates 133 as well as the periphery of the wheel 113 may together form an additional cooling channel 141 which extend over an angular range of approx. 270° from the location A where the springs 3 are applied into the receiving shells 111 up to the location B where the springs 3 from the two belt faces of the transport belts 119 which likewise may run in a cooling channel, are led away out of the receiving shells 111. As a result the receiving shells move within the cooling channel 141. The cross section of the cooling channel may be reduced by reducing the distance of the cover plating 139 to the receiving shells 11 between the location A and the location B.

In the third embodiment of the invention according to Figure 10 in turn there is shown a spring winding device 1 in perspective. On the periphery of the transport wheel 11 in this embodiment of the invention there are formed radially projecting blades 143 between which the springs 3 wound on the spring winding device 1 may be loosely applied. Clearly more visible here is a cooling channel 141 which may be formed by the cover plating 139 and the laterally arranged circular ring shaped guide plates 133. The cooling channel 141 begins inasmuch as one is required in the region A where the springs 3 are layed onto the cooling wheel 113. It ends below the transport device 117 which in this second embodiment consists of a disk-shaped wheel 145 on whose periphery in pairs there are fastened carriers 147 in pairs with which the springs 3 are gripped at their end rings and are removed from the transport wheel 113. The distance c of the blades 143 is

somewhat smaller than the length of the maximally pressed-together spring 3 when it is transfered from the guide through the guide plates 133 to the transport means 117. The pressing together of the springs 3 is in turn effected by the two stationary circular ring shaped guide plates 133 fastened laterally of the transport wheel 113 or laterally of the blades 143. Their distance is at the location A the largest and reaches the minimum at the location B. Of course it is also in this embodiment of the invention possible by way of variation of the mutual distance of the circular ring shaped guide plates 133 to produce a non-continuous running canal cross section. The construction of the transport wheel 113 may correspond to that of the first as well as to that of the second embodiment example.

In the fourth formation of the invention according to Figure 11 the transport wheel 113 comprises peripheral semi-circular incisions 149 into which the springs 3 are applied at the location A and at the location B may be removed. Otherwise the cooling channel 141 comprising the cover plate 139 and (not visible in Figure 11) semi-circular guide plates 133 is represented open on one side (front guide plate 133 omitted).

Patent claims

1. A method for the transport of springs (3) for the manufacture of spring interiors for mattresses and upholstery from a spring winding machine (1) to a further processing installation for the springs, comprising the following method steps:

a) take-over and transfer of each individual spring (3) from a take-over location (A) to the spring winding device (1)

b) transporting the springs (3) with the first transport element (13) firmly holding the springs (3) to a transfer location (B) to the further processing installation,

c) transfer of the springs (3) from the first transport element (13) to a second transport element (9) at the transfer location (B) for the further transport of the springs (3) for manufacture of the spring interior in an assembly device

characterised in that

d) the springs (3) from the spring winding machine (1) loosely get into a spring receiver (11, 111) on the periphery of a transport wheel (13, 113) serving as a first transport element,

e) the springs (3) at the end rings (3', 3") in the spring receiver (11, 111) are gripped at the end face and are at least partly pressed together by means (25, 133) reducing the height (h) of the springs (3),

f) the springs (3) after the reduction of their height (h) up to the distance (a) between the means (25, 133) are held temporarily pressed together,

g) by rotating the transport wheel (13) between the means (25, 133) are led further and

h) at the end of a settable rotation angle of the transport wheel (13, 113) are guided to the subsequent second transport means (9) and

i) from the latter are led out of the transport wheel (13, 113) and taken over.

2. A method according to claim 1, characterised in that the springs (3) by way of the gravity and/or by way of a counter-hand (10) are conveyed radially into the spring receivers (11, 111) of the transport wheel (13, 113) or that the springs (3) are directly radially wound into the spring receivers (11, 111).

3. A method according to claim 1 or 2, characterised in that the first end ring (3') of the spring (3) in the spring receiver (11) by way of an advancer (25) pressing the springs (3) axially together comes to bear on the end-face side with a first guide plate (21) lying laterally of the transport wheel (13) and on rotating the transport wheel (13) the second end ring (3") comes to bear on the second guide plate (21) which connects laterally to the end face of the advancer (25).

4. A method according to claim 3, characterised in that the springs in the spring receivers (11, 111) are supported radially by a cover plating (139, 47, 51) and on transport with the end rings (3', 3") are pushed draggingly along the guide plates (21, 133).

5. A method according to one of the claims 1, 2 and 4, characterised in that the springs (3) in the spring receivers (111) by way of guide platings (133) terminating the spring receivers (111) at the end face, and whose distance between the take-over location (A) and the transfer location (B) reduces, are successively axially pressed together on rotation of the transport wheel (13).

6. An installation for the transport of springs (3) for the manufacture of spring interiors for mattresses and cushions from a spring winding machine (1) to a further processing installation with a drivable transport wheel (13, 113) with spring receivers (11, 111), said transport wheel being arranged between the spring winding machine (1) and the further processing installation, characterised in that the spring receivers (11, 111) are arranged on the periphery of the transport wheel (13, 113) and at the end-face ends are limited by holding and guiding plates (21, 133) whose mutual distance (a) may be set or adjusted.

7. An installation according to claim 6, characterised in that the maximal distance of the guide plates (21) is larger than the height (h_{max}) of the largest spring manufacturable on the installation and that the minimal distance is smaller than the height (h_{min}) of the smallest spring.

8. An installation according to one of the claims 6 or 7, characterised in that in one of the guide plates (21) there is admitted a recess (23) for inserting an advancer (25) and that outside the recess (23) there is fastened a shell section (24) on which the end of a spring (3) which is layed into the receiver (11) projects beyond the transport wheel (13).

9. An installation according to claim 8, characterised in that axially outside the recess (23) there is arranged the advancer (25) which by way of a linear drive (27) may be led to and away from the guide plate (21).

10. An installation according to one of the claims 6 to 9, characterised in that each receiver (111) comprises a plurality of shell sections (125, 127, 129) which partly overlap in a scale-like manner of which at least one of the shell sections (125, 129) is axially displaceable with respect to the transport wheel (113) and a further one is rigidly connected to the transport wheel.

11. An installation according to claim 10, characterised in that on the axially displaceable shell sections (125, 129) there are arranged guide rollers or bolts (131) which engage into guide grooves (123) on the peripheries of the stationary rings (121).

12. An installation according to one of the claims 10 to 11, characterised in that the receivers (111) consist of a plurality of incisions (149) incorporated on the periphery of the transport wheel (113) for the loose laying-in of the springs (3).

13. An installation according to one of the claims 6 to 12, characterised in that at a radial distance to the periphery of the transport wheel (13, 113) there is fastened a cover and guide belt (139, 47).

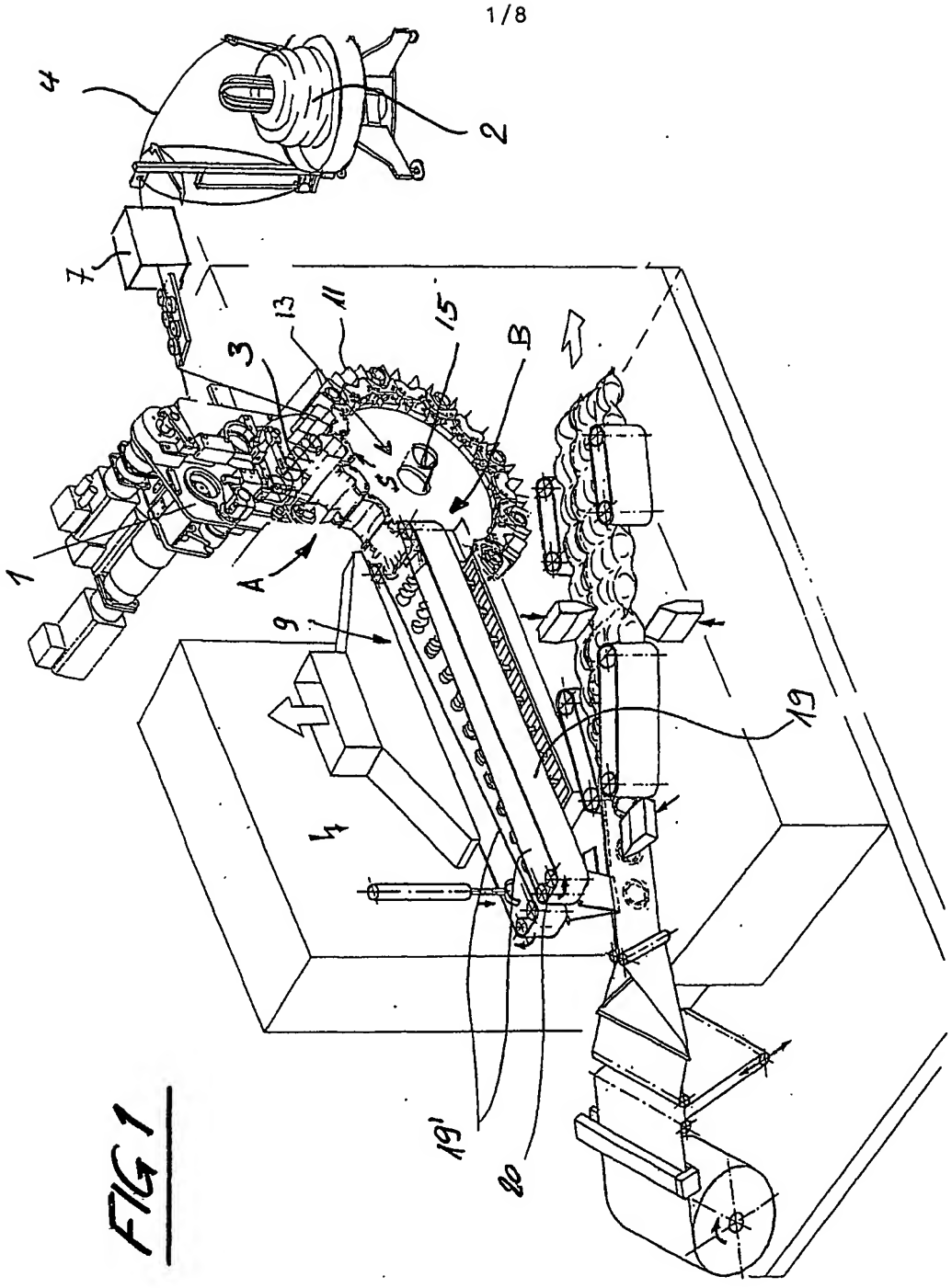

FIG 1

FIG 2

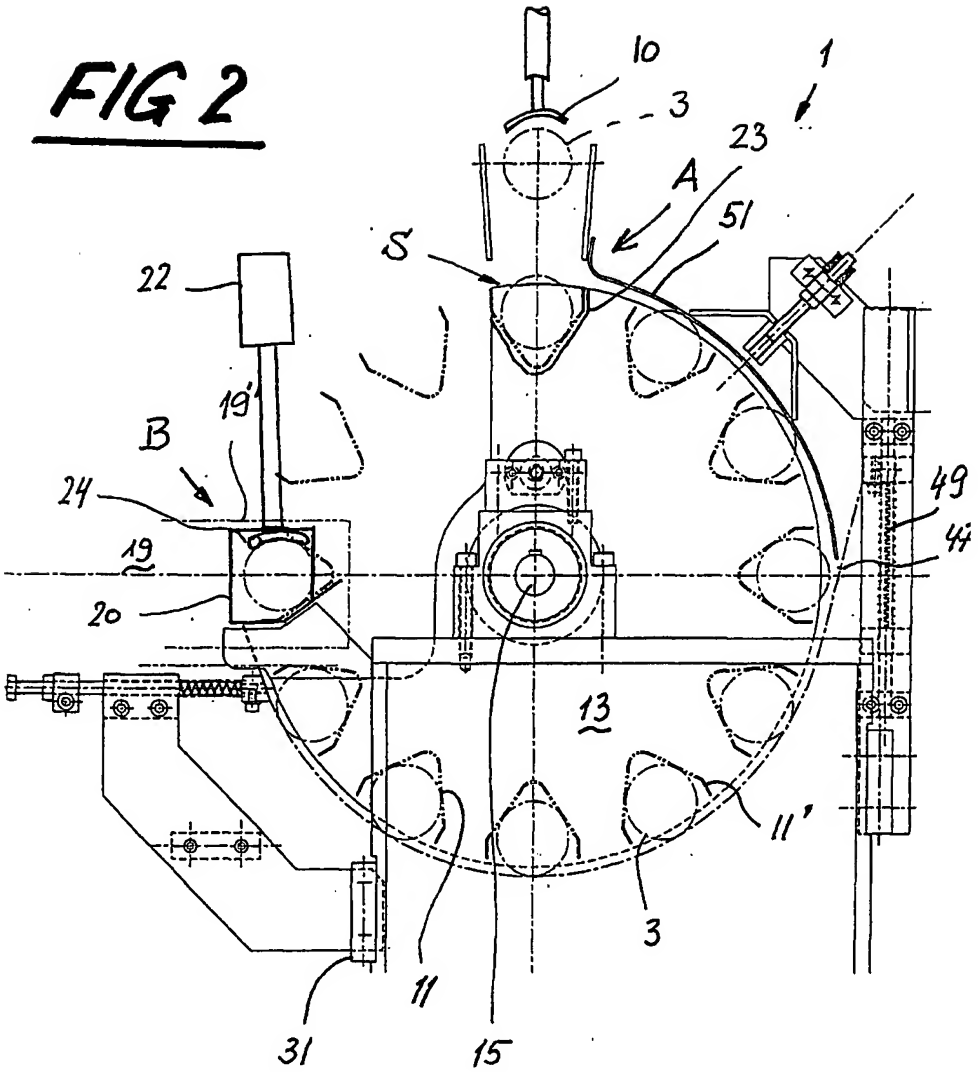

FIG 3

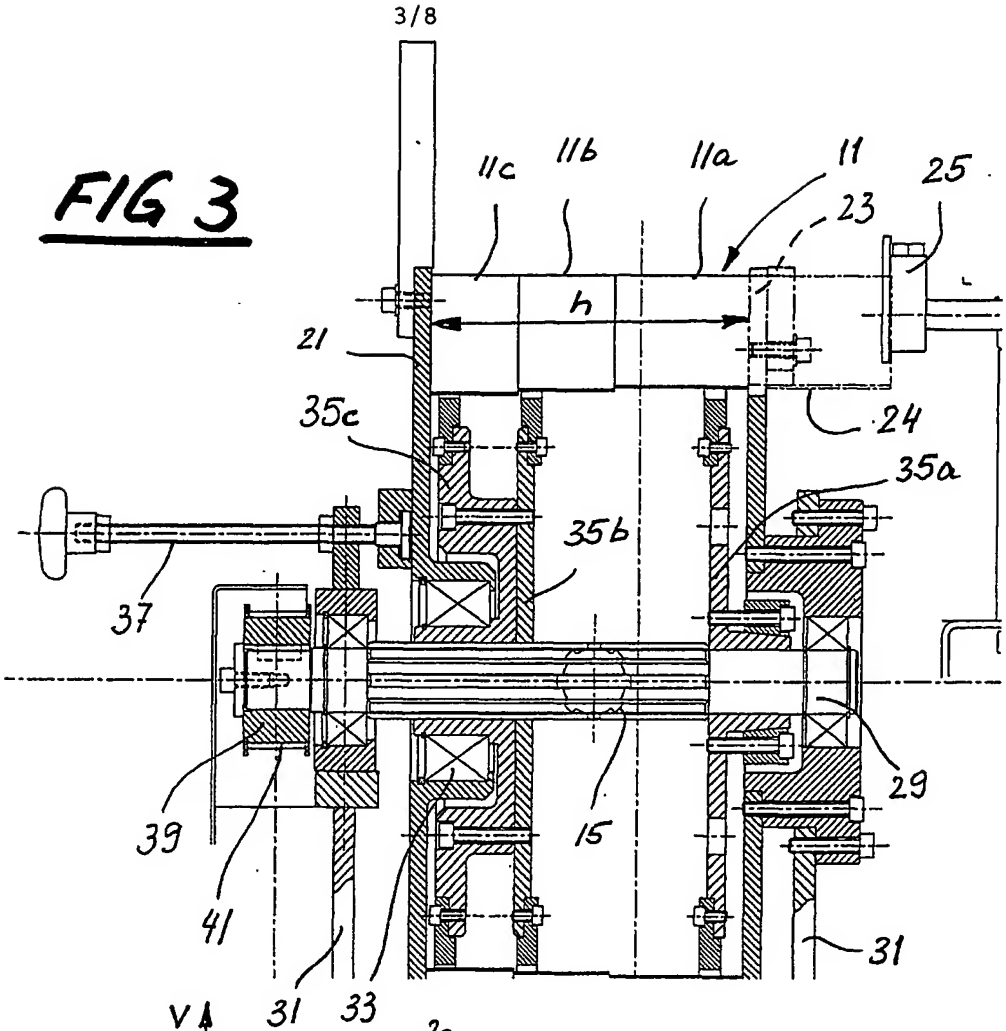
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FIG 4

FIG 5

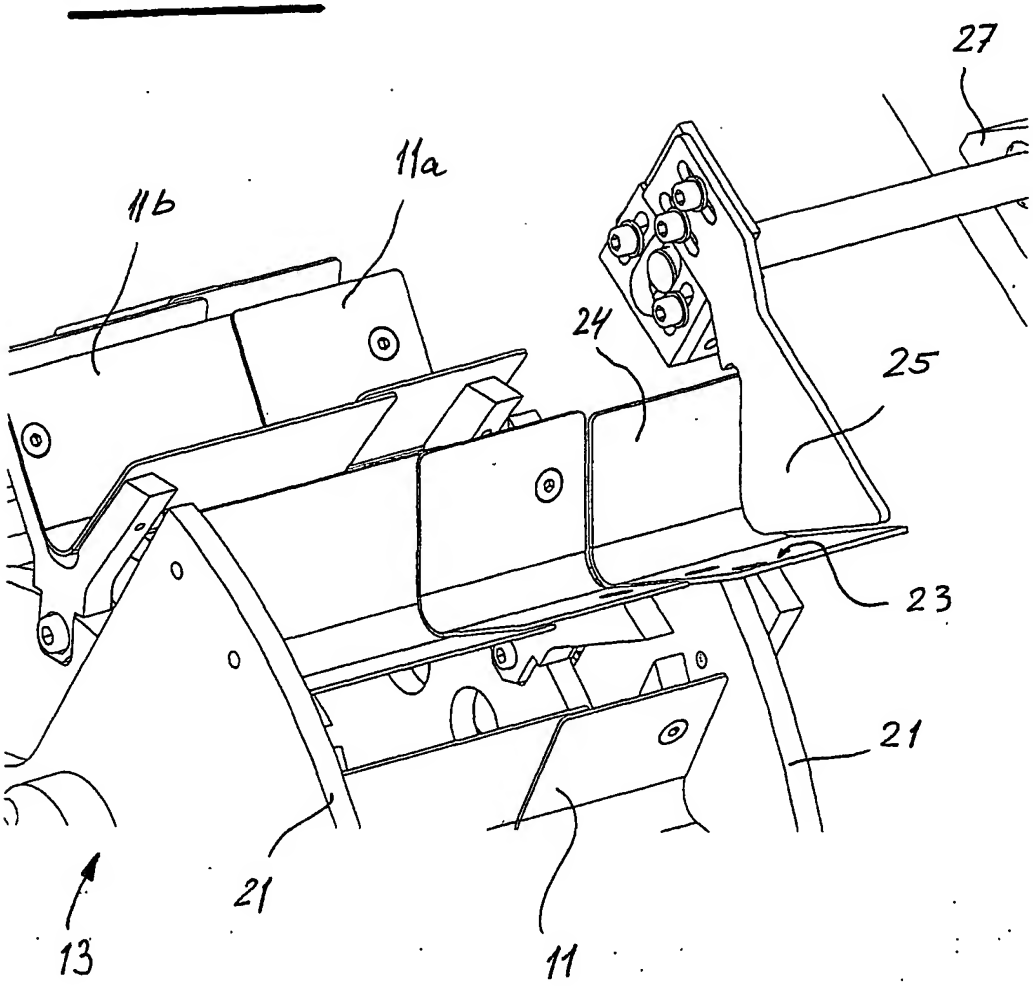
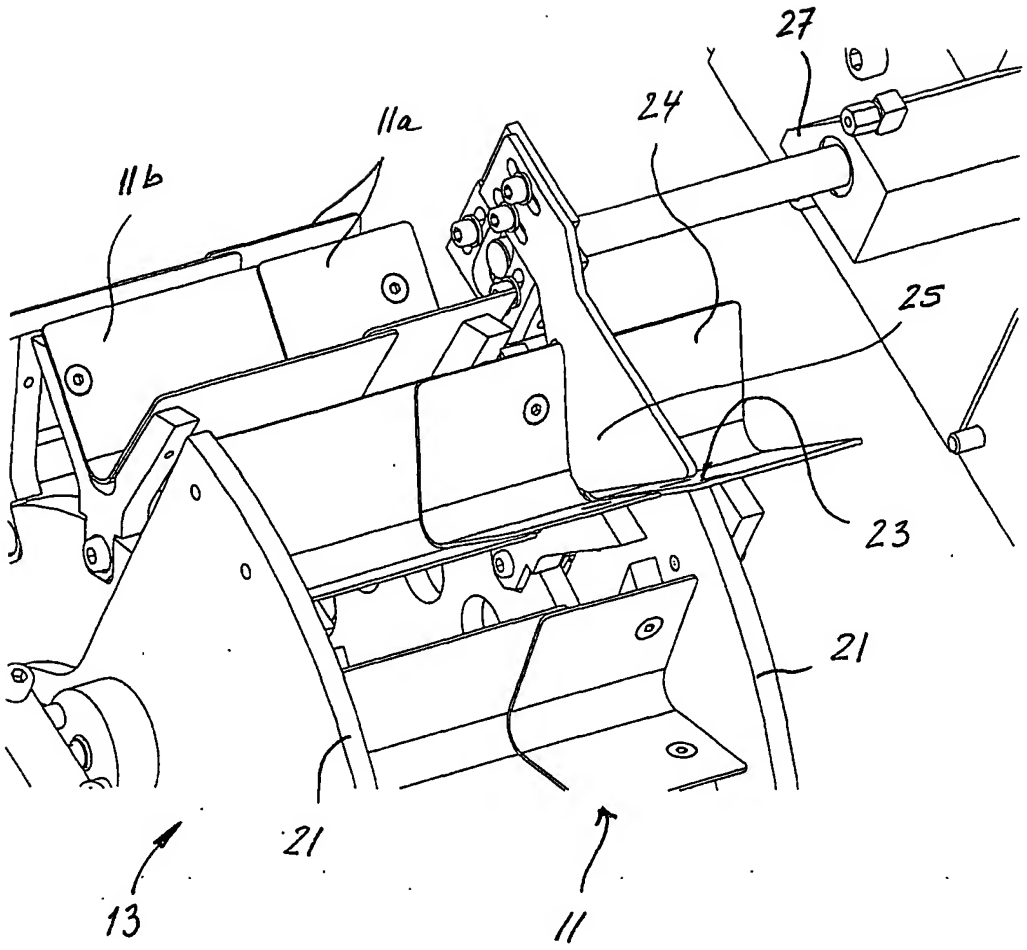


FIG 6



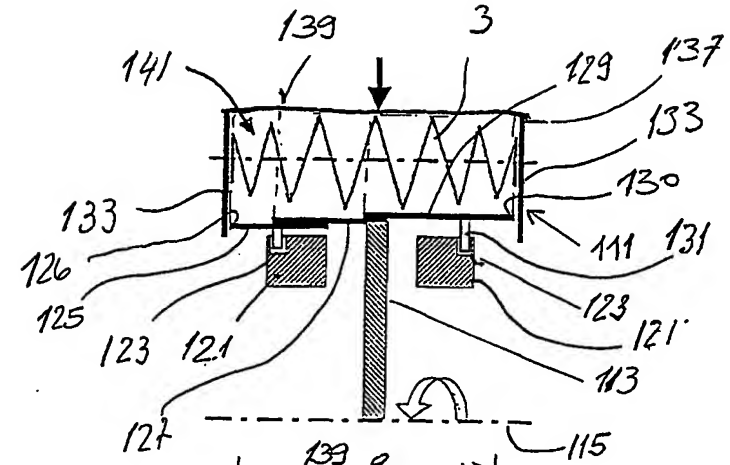


FIG 7

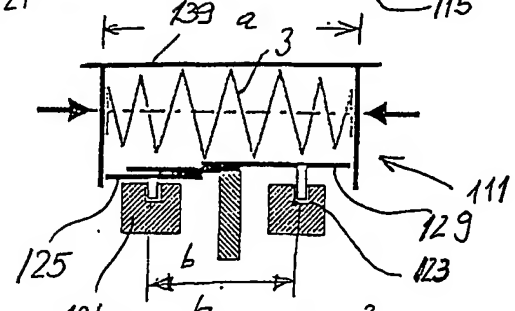


FIG 8

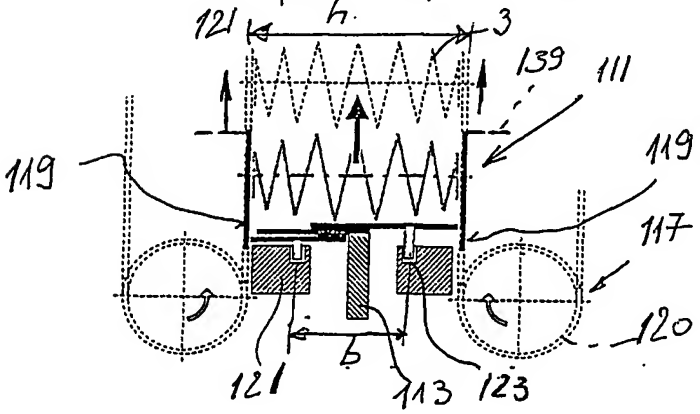


FIG 9

FIG 10

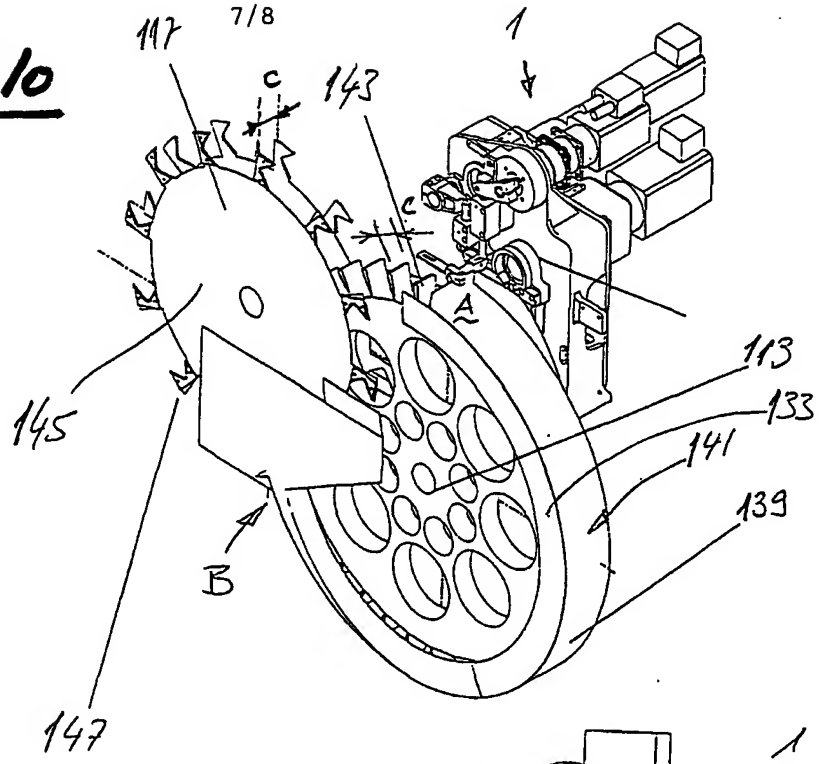


FIG 11

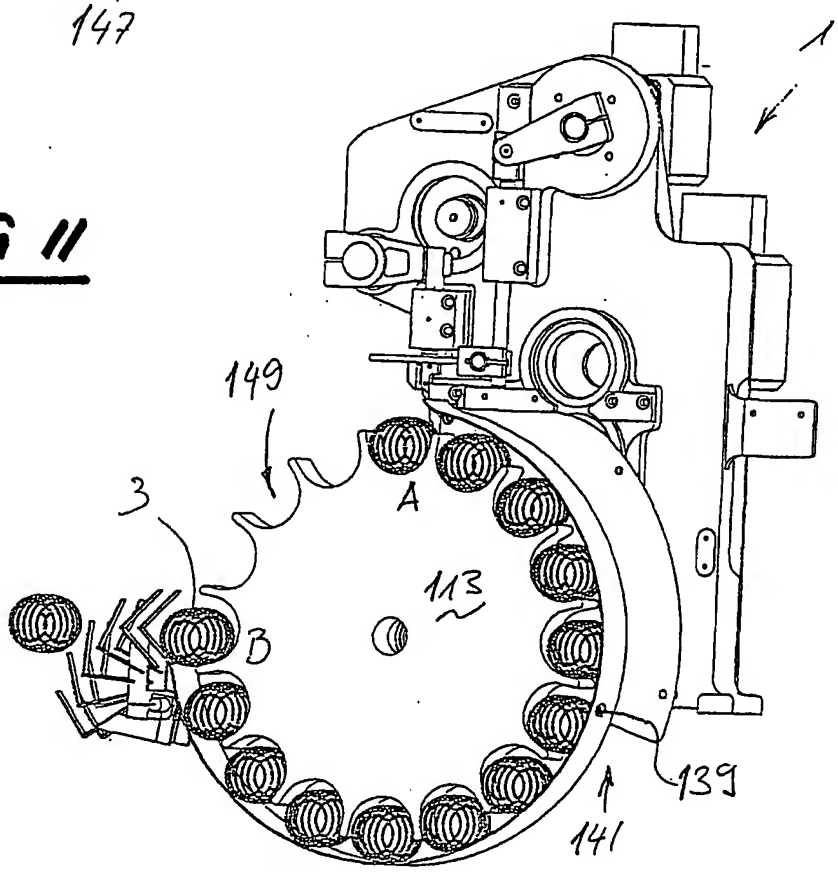
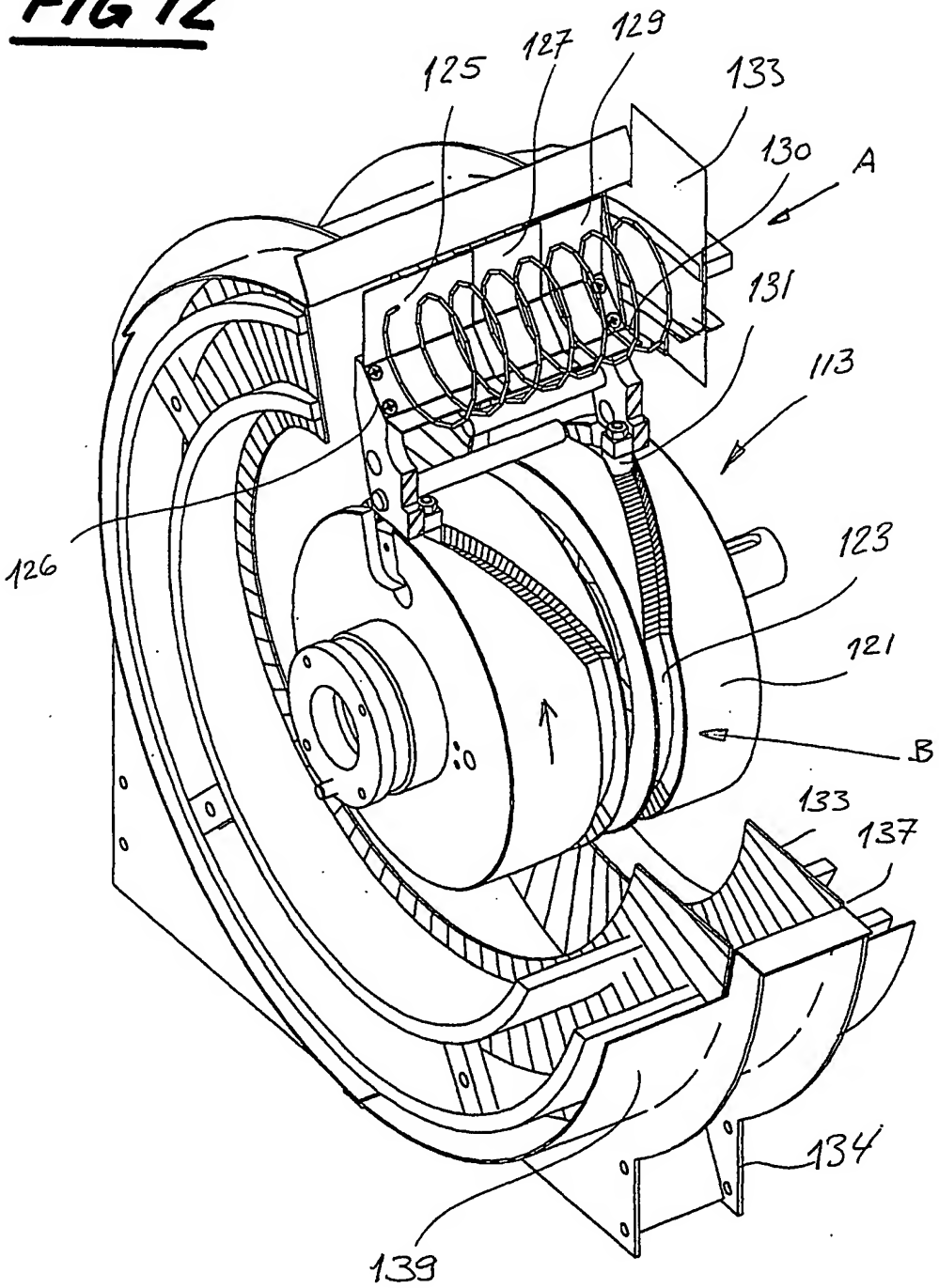


FIG 12



INTERNATIONAL SEARCH REPORT

PCT/CH 01/00648

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B21F33/04 B68G9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B21F B68G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 1 774 545 A (HARRY CHAPMAN) 2 September 1930 (1930-09-02) page 2, line 115 -page 3, line 51; figures 3,8,9	1-4,8,9
A	WO 99 50175 A (SPRINGFORM TECHNOLOGY LIMITED ;WHITWORTH IAN JAMES (GB)) 7 October 1999 (1999-10-07) page 8, line 19 -page 9, line 6; figure 2	1,5-7
A	DE 199 50 399 A (SPUEHL AG ST GALLEN WITTENBACH) 29 June 2000 (2000-06-29) column 2, line 46-48; figure 2	1
A	EP 0 967 031 A (MATSUSHITA IND CO LTD) 29 December 1999 (1999-12-29) cited in the application paragraph '0036!; figure 1	1

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 January 2002	06/02/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Marc Augé

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 47348 A (SPUEHL AG ST GALLEN ;KELLER ROLAND (CH)) 17 August 2000 (2000-08-17) page 4, line 15-22; figure 2	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/CH 01/00648

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